

IN THE CLAIMS

Please cancel non-elected claims 36-47, and 78, without prejudice or disclaimer.

1 Claims 1 through 6. (Canceled)

2 7. (Previously Presented) A cathode for an electron tube, comprising:

3 a metal base; and

4 an electron-emitting material layer coated on the metal base, said electron-
5 emitting material layer comprising a needle-shaped conductive material;

6 said needle-shaped conductive material being at least one material selected from a
7 group consisting essentially of carbon, indium tin oxide, nickel, magnesium, rhenium,
8 molybdenum and platinum;

9 said needle-shaped conductive material being a carbonaceous material, said
10 needle-shaped conductive material being in a range of 0.01 to 30% by weight based on a
11 total weight of said electron-emitting material layer, and a thickness of said electron-
12 emitting material layer being in a range of 30 to 80 μm .

Claims 8 and 9. (Canceled)

1 10. (Previously Presented) A cathode for an electron tube, comprising:

2 a metal base; and

3 an electron-emitting material layer coated on the metal base, said electron-
4 emitting material layer comprising a needle-shaped conductive material and having a
5 surface roughness corresponding to a distance between a highest point and a lowest point
6 on a surface of the electron-emitting material layer being less than 10 microns.

Claim 11. (Canceled)

1 12. (Previously Presented) A cathode for an electron tube, comprising:
2 a metal base; and
3 an electron-emitting material layer coated on the metal base, said electron-
4 emitting material layer comprising a needle-shaped conductive material;
5 said needle-shaped conductive material being at least one material selected from a
6 group consisting essentially of indium tin oxide, nickel, magnesium, rhenium,
7 molybdenum and platinum.

Claims 13 through 15. (Canceled)

1 16. (Previously Presented) The cathode of claim 10, said needle-shaped
2 conductive material in the electron-emitting material layer being in a range of 0.01 to
3 30% by weight based on a total weight of said electron-emitting material.

1 17. (Previously Presented) A cathode for an electron tube, comprising:

2 a metal base; and

3 an electron-emitting material layer coated on the metal base, said electron-
4 emitting material layer comprising a needle-shaped conductive material, and a thickness
5 of said electron-emitting material layer being in a range of 30 to 80 μm .

Claims 18 and 19. (Canceled)

1 20. (Previously Presented) The cathode of claim 10, further comprising a metal

2 layer including nickel grains having sizes smaller than sizes of grains in said metal base,
3 said metal layer being formed between said metal base and said electron-emitting
4 material layer.

1 21. (Previously Presented) The cathode of claim 20, said metal layer further

2 including at least one metal selected from a group consisting essentially of aluminum
3 (Al), tungsten (W), tantalum (Ta), chromium (Cr), magnesium (Mg), silicon (Si) and
4 zirconium (Zr).

1 22. (Previously Presented) The cathode of claim 10, further comprising a metal

2 layer formed between said metal base and said electron-emitting material layer, a
3 thickness of said metal layer being in a range of 1 to 30 μm .

Claims 23 through 28. (Canceled)

1 29. (Previously Presented) An oxide cathode for an electron tube, comprising:

2 a metal base; and

3 an electron-emitting material layer coated on the metal base, said electron-
4 emitting material layer comprising a needle-shaped conductive material;

5 said needle-shaped conductive material being at least one material selected from a
6 group consisting essentially of carbon, indium tin oxide, nickel, magnesium, rhenium,
7 molybdenum and platinum;

8 said needle-shaped conductive material being a carbonaceous material, said
9 needle-shaped conductive material being in a range of 0.01 to 30% by weight based on a
10 total weight of said electron-emitting material layer, and a thickness of said electron-
11 emitting material layer being in a range of 30 to 80 μm .

Claims 30 through 35. (Canceled)

1 36. (Previously Presented) The method of claim 78, wherein the coating step
2 includes applying pressure on a coating layer in order to attain a desired level of surface
3 roughness.

1 37. (Previously Presented) The method of claim 36, wherein the step of applying
2 the pressure on the coating layer comprises at least one of printing, electrodeposition and
3 painting.

1 38. (Previously Presented) The method of claim 37, wherein the printing includes
2 at least one of screen printing and roll coating.

1 39. (Previously Presented) The method of claim 78, wherein the coating step
2 comprises coating to a thickness in a range of 30 to 80 microns so as to obtain good
3 electron emission characteristics.

1 40. (Previously Presented) The method of claim 78, said needle-shaped
2 conductive material in the electron-emitting layer being in a range of 0.01 to 30% by
3 weight based on a total weight of electron-emitting material.

1 41. (Previously Presented) The method of claim 78, further comprising the step,
2 between the providing step and the coating step, of forming a metal layer on the metal
base.

1 42. (Previously Presented) The method of claim 41, wherein the metal layer
2 comprises nickel and a refractory metal to reinforce mechanical strength of the cathode.

1 43. (Previously Presented) The method of claim 41, further comprising the step,
2 prior to forming the metal layer on the metal base, of mixing nickel powder and at least
3 one of tungsten and aluminum as a reducing agent to prepare a metal layer material.

1 44. (Previously Presented) The method of claim 43, further comprising the step,
2 after the mixing step, of homogeneously mixing the metal layer material with an organic
3 binder and a liquid-phase organic solvent to prepare a paste which, when deposited on the
4 metal base, forms the metal layer on the metal base.

1 45. (Previously Presented) The method of claim 41, wherein the forming step
2 comprises applying metal layer material to the metal base, and then thermally treating the
3 applied metal layer material in one of a vacuum and an inert gas atmosphere to obtain the
4 metal layer without organic matter.

1 46. (Previously Presented) The method of claim 41, wherein the forming step
2 comprises one of printing, spraying, electrodeposition and painting.

1 47. (Previously Presented) A cathode prepared by the method of claim 78.

1 48. (Previously Presented) A cathode, comprising:

2 a metal base;

3 layer means disposed upon said metal base for emitting electrons; and

4 additional means for providing electrically conducting paths through said layer

5 means for emitting electrons, said additional means comprising a needle-shaped

6 electrically conductive material having a specific resistance not greater than 10^{-1} ohms

7 centimeter, and comprising 0.01% by weight to 30% by weight of said layer means.

1 49. (Previously Presented) The cathode of claim 48, further comprising a metal

2 layer exhibiting a grain size smaller than said metal base and interposed between said

3 metal base and said layer means.

1 50. (Previously Presented) The cathode of claim 48, said needle-shaped

2 conductive material being selected from a group consisting essentially of carbon, indium

3 tin oxide, nickel, magnesium, rhenium, molybdenum and platinum.

1 51. (Previously Presented) A cathode, comprising:

2 a metal base;

3 a layer of electron-emitting material disposed upon said base; and

4 a needle-shaped electrically conductive material providing electrically conductive

5 paths disposed throughout said layer of electron-emitting material;

6 said needle-shaped electrically conductive material having a specific resistance

7 not greater than 10^{-1} ohms centimeter.

1 52. (Previously Presented) The cathode of claim 51, further comprising a metal
2 layer exhibiting a grain size smaller than said metal base and interposed between said
3 metal base and said layer of electron-emitting material.

1 53. (Previously Presented) The cathode of claim 51, said conductive material
2 comprising 0.01% by weight to 30% by weight of said layer of electron-emitting material.

Claim 54. (Canceled)

1 55. (Previously Presented) The cathode of claim 51, said layer of electron-
2 emitting material having a surface roughness corresponding to a distance between a
3 highest point and a lowest point on a surface of the electron-emitting material being less
4 than 10 microns.

1 56. (Previously Presented) A cathode, comprising:
2 a metal base;
3 a layer of electron-emitting material disposed upon said base; and
4 a needle-shaped electrically conductive material providing electrically conductive
5 paths disposed throughout said layer of electron-emitting material;

6 said layer of electron-emitting material having a thickness in a range of 30 microns
7 to 80 microns.

1 57. (Previously Presented) A cathode, comprising:

2 a metal base; and

3 a layer disposed upon said metal base;

4 said layer comprising an electron-emitting material, and a needle-shaped
5 electrically conductive material disposed within said layer and having a specific
6 resistance less than a specific resistance of said electron-emitting material.

1 58. (Previously Presented) The cathode of claim 57, said needle-shaped
2 electrically conductive material providing electrically conductive paths in said layer.

1 59. (Previously Presented) The cathode of claim 57, said layer having a surface
2 roughness corresponding to a distance between a highest point and a lowest point on a
3 surface of the electron-emitting material being less than 10 microns.

1 60. (Previously Presented) The cathode of claim 57, said conductive material
2 having a specific resistance not greater than 10^{-1} ohms centimeter.

1 61. (Previously Presented) The cathode of claim 57, said layer having a thickness

2 in a range of 30 microns to 80 microns.

1 62. (Previously Presented) The cathode of claim 57, said conductive material
2 comprising 0.01% by weight to 30% by weight of said layer.

1 63. (Previously Presented) A cathode, comprising:

2 a metal base; and

3 a layer disposed upon said base;

4 said layer comprising an electron-emitting material, and a needle-shaped
5 electrically conductive material having a specific resistance not greater than 10^{-1} ohms
6 centimeter.

1 64. (Previously Presented) The cathode of claim 63, further comprising a metal
2 layer having a grain size smaller than a grain size of said metal base, and interposed
3 between said metal base and said layer.

1 65. (Previously Presented) The cathode of claim 63, said conductive material
2 comprising 0.01% by weight to 30% by weight of said layer.

1 66. (Previously Presented) The cathode of claim 63, said layer having a surface
2 roughness corresponding to a distance between a highest point and a lowest point on a

3 surface of the electron-emitting material being less than 10 microns.

1 67. (Previously Presented) The cathode of claim 63, said layer of electron-
2 emitting material having a thickness in a range of 30 microns to 80 microns.

1 68. (Previously Presented) A cathode, comprising:

2 a metal base;

3 a layer of electron-emitting material including an electron-emitting barium-based
4 alkali-earth metal carbonate material disposed upon said base; and

5 a needle-shaped electrically conductive material providing electrically conductive
6 paths in said layer of electron-emitting material;

7 said conductive material having a specific resistance not greater than 10^{-1} ohms
8 centimeter.

1 69. (Previously Presented) The cathode of claim 68, further comprising a metal
2 layer having a grain size smaller than a grain size of said metal base, and interposed
3 between said metal base and said layer of electron-emitting material.

1 70. (Previously Presented) The cathode of claim 68, said conductive material
2 comprising 0.01% by weight to 30% by weight of said metal layer.

1 Claim 71. (Canceled)

1 72. (Previously Presented) A cathode, comprising:

2 a metal base; and

3 a layer formed on said base from a carbonate paste comprising a barium-based
4 carbonate electron-emitter and a needle-shaped electrically conductive powder;

5 said needle-shaped electrically conductive powder having a specific resistance not
6 greater than 10^{-1} ohms centimeter.

1 73. (Previously Presented) The cathode of claim 72, further comprising a metal

2 layer having a grain size smaller than a grain size of said metal base and interposed
3 between said metal base and said layer.

1 74. (Previously Presented) The cathode of claim 72, said needle-shaped
2 electrically conductive powder comprising 0.01% by weight to 30% by weight of said
3 layer.

1 Claim 75. (Canceled)

1 76. (Previously Presented) The cathode of claim 72, said layer having a surface
2 roughness corresponding to a distance between a highest point and a lowest point on a

3 surface of the layer being less than 10 microns.

1 77. (Previously Presented) A cathode, comprising:

2 a metal base; and

3 a layer formed on said base from a carbonate paste comprising a barium-based
4 carbonate electron-emitter and a needle-shaped electrically conductive powder;

5 said layer having a thickness in a range of 30 microns to 80 microns.

1 78. (Previously Presented) A method of preparing a cathode for an electron tube,

2 comprising the steps of:

3 providing a metal base;

4 depositing on said metal base a carbonate paste comprising a barium-based
5 carbonate electron emitter and a needle-shaped conductive material; and

6 coating the carbonate paste containing the needle-shaped conductive material onto
7 the metal base, and then drying to form an electron-emitting layer of the cathode.

1 79. (Previously Presented) The cathode of claim 17, said electron-emitting

2 material layer having a surface roughness corresponding to a distance between a highest

3 point and a lowest point on a surface of said electron-emitting material layer being less

4 than 10 microns.